SHORT COMMUNICATION

Fabrication of Schottky-Barrier Diodes using a Thick Film Technique

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Schottky-barrier diodes have been fabricated using a thick-film technique. A change in V-I characteristic with firing temperature has been observed. This technique is compatible with hybrid circuit technology.

1. INTRODUCTION

Schottky barrier-diode fabrication has been reported by various authors using different technique, viz. point contact, vacuum evaporation, chemical deposition sputtering¹. Another fabrication method has been successfully tried to achieve Schottky barrier V-I characteristics within reasonable limits. This method may be useful in the fabrication of Schottky barrier diodes in hybrid circuits, which are gaining importance because of their conspicuous advantage over thin-film hybrid circuits in certain applications.

2. FABRICATION

An n-type silicon wafer of 400 ± 25 microns thickness, with resistivity of 6 ohm-cm and a surface orientation $\langle 111 \rangle$ was used. The wafer was etched down by keeping it in fast silicon etchant (75 ml Conc. HNO_3 + 9 ml 48% HF + 17 ml CH_3COOH) for 80 minutes. The purpose was to reduce the bulk resistance. The etched wafer was cut into various pieces which were then placed on freshly silver-paste² printed Alumina substrate. The substrate was dried at 150°C for 15 minutes and fired at 900°C in a DEK840 furnace in nitrogen atmosphere (to avoid silicon surface oxidation) to achieve ohmic contact at the bottom of the wafer. Circles of diameter 0.45 mm in 3×12 array were screen printed on top using Poly390 screen, and fired at 500, 600, 750, 800, and 850°C . The firing time was ten minutes.

RESULTS AND CONCLUSIONS

The comparison of forward cut-in and reverse breakdown voltages for specimens fired at different temperatures is shown in Figure 1. The results suggest the presence of a thicker interfacial layer¹ between the fired silver and silicon for the samples fired at lower temperatures. The samples fired at and above 600°C showed very good adhesion to the surface. Ohmic contacts are formed above 840°C , the eutectic temperature of silver-silicon, as expected. This technique can be adopted using pastes of other metals available commercially

FIGURE 1 V-I characteristic of the Schottky barrier diodes as a function of firing temperature.

for thick film work. With the recent improvement in thick film technology the area of the diode can be reduced considerably.

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